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3

TRACHEOTOMY

IN

CHRONIC DISEASE OF THE LARYNX.

BY

LENNOX BROWNE, F.R.C.S. Ed.,

SENIOR SURGEON TO THE CENTRAL LONDON THROAT AND EAR HOSPITAL,
SURGEON AND AURAL SURGEON TO THE ROYAL SOCIETY OF MUSICIANS,
CONSULTING SURGEON TO THE NEWCASTLE THROAT AND EAR HOSPITAL,
VICE-PRESIDENT OF THE BRITISH LARYNGOLOGICAL AND
RHINOLOGICAL ASSOCIATION, ETC., ETC.

[*Reprinted from the* JOURNAL OF LARYNGOLOGY AND RHINOLOGY.]

London:
R. ANDERSON & CO.,
14, COCKSPUR STREET,
CHARING CROSS, S.W.

Philadelphia:
P. BLAKISTON SON & CO.,
1012, WALNUT STREET.

1889.

PRICE ONE SHILLING.

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LENNOX BROWNE, F.R.C.S.Ed.,

Senior Surgeon to the Central London Throat and Ear Hospital, Surgeon and Aural Surgeon to the Royal Society of Musicians, Consulting Surgeon to the Newcastle Throat and Ear Hospital, Vice-President of the British Laryngological and Rhinological Association, etc., etc.

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1889.

LONDON :

PRINTED BY WITHERBY AND CO., 325A, HIGH HOLBORN, W.C.

PREFATORY NOTE.

THIS reprint is but a slight amplification of a paper, which, on the invitation of the Council, I had recently the honour to read at the second Session of the British Laryngological and Rhinological Association, with the view of opening a discussion on "The Relative Merits of Early and Late Tracheotomy in Chronic Disease of the Larynx."

I am led to believe that a more extended publication may be serviceable, not only because the majority of those who took part in the debate were in favour of the opinions I have propounded, but also, and mainly, because, so far as I have been able to ascertain, no attempt has hitherto been made to treat this important question, comprehensively and comparatively, in any standard Surgical work—whether special or general—nor in a separate essay.

The subject might have been treated at much greater length; but my purpose has not been to exhaust it, but rather to draw renewed attention to the valuable aid, both in diagnosis and prognosis, which the surgeon may obtain from the laryngoscope when contemplating operative procedures in a case of chronic laryngeal disease.

L. B.

36, WEYMOUTH STREET,
PORTLAND PLACE, W.,
April, 1889.

ON TRACHEOTOMY

IN CHRONIC DISEASE OF THE LARYNX.

By LENNOX BROWNE, F.R.C.S.Ed.

THE relative merits of early and late tracheotomy in chronic disease of the upper air passages and, for that matter, the question whether the operation should or should not be performed at all, is one which has hitherto been almost entirely ignored, in precept, indeed, if not in practice, and, notwithstanding that the laryngoscope has now been in use for thirty years, the operation is still for the most part performed on indications—more or less accurate—of urgent dyspnœa, with, to say the least of it, insufficient attention to the physical nature of the obstruction, or to the possibility of relieving it by other than surgical means. The subject will be treated in regard to the following chronic or sub-acute laryngeal diseases :—

1. Chronic Inflammation and Perichondritis.
2. Lupus.
3. Tubercle.
4. Syphilis.
5. Benign Growths.
6. Malignant Growths.
7. Neuroses.

As a preliminary basis of our consideration, I would venture to announce certain postulates :—

(*a*) Tracheotomy is indicated in chronic laryngeal disease (1) on account of urgent dyspnœa caused by an exacerbation of inflammation in the course of a chronic malady ; and (2) in certain diseases in which our prognosis points to a progressive, though possibly gradual, increase of respiratory difficulty. In the latter case the operation, if performed early, —that is to say, so soon as continued dyspnœa becomes a prominent symptom—is more likely to be both immediately and remotely successful, than if delayed until resulting pulmonary changes have become pronounced.

(*b*) The degree of vital danger which exists in a case of laryngeal and tracheal obstruction depends mainly on the situation of the lesion.

(*c*) Supra-glottic obstruction rarely causes vital risk. For example, inflammation, acute or chronic, unaccompanied, be it premised, by true œdema, and leading to thickening, ulceration, and cicatrisation of the epiglottis, ary-epiglottic folds, or of the ventricular bands, is not often accompanied by urgent dyspnœa, and this is indifferently true, whether the case be one of phthisis, lupus, or syphilis. I have made an exception with regard to true œdema, not such as exists in phthisis, which is in no sense of that nature, because I am of opinion, with Sestier and Morell Mackenzie, who hold that not only is œdema of the larynx much more rare than is generally supposed in Bright's disease—Mackenzie did not find it once in 200 cases—or in general anasarca, but also "that the intervention of a phlegmasia of the pharynx and larynx, or neighbouring tissues, is nearly always necessary." I would go further, and express my belief that neither in the case of such an acute œdema, accompanied as it is by a general phlegmasia, usually the result of a septicæmia, nor in that of one occurring in the course of a chronic syphilitic laryngitis, and causing difficulty of breathing, is the œdema often limited to supra-glottic regions, but that that most dangerous of all situations, the portion immediately below the glottis, is almost invariably involved, and that this is proved subjectively, even where not visible, by the character of the dyspnœa.

An exception in some sense has also to be made to this proposition in regard to cancer, in which the disease, although it be apparently situated at a spot not interfering with the glottic patency, may, by extension into the deeper tissues, produce an obstruction which is to all clinical intents and purposes of the nature of a neurosis—that is to say, it is due to a paralysis of intrinsic respiratory muscles.

(*d*) Obstruction of the lumen of the glottis itself—by which I mean of that space bounded by the vocal cords—may be considerable without producing vital dyspnœa. Examples of the truth of this statement are frequently afforded in the cases of benign neoplasms, when attached by broad bases to the superior surface or free edge of the vocal cords. The circumstance of this absence of respiratory difficulty is indeed of high diagnostic import in regard to their benign character.

A like, though not so complete, an immunity is also observed in cases of congenital or cicatricial webs of the vocal cords where there is no implication of other contiguous structure.

(*e*) Sub-glottic obstruction, whatever the cause, is always attended with the gravest danger to life, and it can be further postulated that the lower

the situation of the obstruction in the windpipe, the greater is the risk ; and also the less is the chance of relief being afforded by an artificial opening.

(*f*) It is not unimportant to premise—though not amongst an Association of Laryngologists, and less so than it was twenty years ago, even for the guidance of the general surgeon—that no tracheotomy ought to be advised, much less performed, on account of chronic—it might indeed be said any—laryngeal disease without a thorough preliminary investigation with the laryngoscope, and further, that the same means of information should be practised before a tracheotomy tube is removed.

One of the first cases of tracheotomy in my independent hospital experience illustrated the necessity for enforcing this precaution, as well as the unwisdom of neglecting it. It occurred to me in 1874, in the person of a gentleman's servant, who had been tracheotomised by the house surgeon of a hospital boasting a special throat department, which was presided over by both a physician and surgeon. Not only was no laryngoscopic examination made prior to the opening of the windpipe—that might well have occurred—but the tube was removed after eleven weeks, and the patient discharged without such a step having been taken. The man came under my hands less than six months later, and was found to be the subject of serious stenosis, due to syphilis. It was urgently necessary to repeat the operation, and though I had the opportunity of seeing the patient for many years afterwards, I was never able to advise withdrawal of the tube. As further illustrations, one has only to look through the morbid specimens in our various museums to see how many cases there were in pre-laryngoscopic days in which tracheotomy was unnecessarily performed, and to recall as one—doubtless of many similar—the case under the care of Liston, quoted by Solis-Cohen, in which a stenosis, having been successfully dilated through the tracheotomy wound from below, the tube was withdrawn, but had to be re-inserted on the following day.

It is fair, therefore, to make this postulate, that while the more expert the laryngologist, both in diagnosis and therapeusis, the less frequent will be tracheotomy in his practice ; so also the less liable will the patient be to suffer from either a too early withdrawal or a too prolonged retention of the tube.

I have no intention of entering into any detailed description of the operation, but would simply say that, except for cases of urgency, and in which the tube will not be required for more than a few days, I never perform or advise *laryngotomy*—that is, introduction of the tube through

the crico-thyroid space. Such an operation is virtually never indicated in chronic disease and seldom in acute maladies. Nor do I, if possible, ever make an opening that does not leave the first ring of the trachea undivided —for division of, or pressure of the tube on, the cricoid cartilage, is very likely indeed to be followed by caries of that structure and other complications. Such a limit in my practice represents the *high* operation, while by the *low* operation I intend to convey one in which the trachea is opened below the inferior boundary of the third ring.

With regard to tubes, without doubt the rectangular tube of Durham carries the palm for all cases in which the instrument has to be worn for any length of time, and is also the best in the first instance where one has plenty of assistants. But, though the old bi-valve tube of Fuller has been very uncompromisingly condemned of recent years, the ease with which it can be introduced where hands to hold retractors and the assistance of dilators are not available, renders this instrument a very serviceable one to the country operator for first use in cases of emergency. Whatever tube is employed, I endeavour to leave it unchanged for forty-eight hours, and then insert the one which is to be retained for the whole length of time of its use.

Proceeding now to detailed consideration of the merits of tracheotomy in the various diseases I have enumerated, we will take that first on the list, viz: 1. *Chronic Laryngitis and Perichondritis.*—I have come across but one author of recent times who speaks of tracheotomy in chronic laryngitis, for it is solely in the sub-glottic and so-called hypertrophic form that such a procedure would ever be necessary. But such a condition is comparatively rare, and is seldom found unassociated with a perichondritis, which may be of a simple or a specific character, and may lead either to an abscess or an anchylosis. At all events, the seat and character of the obstruction are in each case the same, as also are the indications for operation. The cause of sub-mucous infiltration in this region is, I suggest, not only that the mucous membrane is somewhat more loosely attached to the inferior surface of the vocal cords than to the superior, but also that there is a natural tendency towards œdema in the more pendulous position. This limited œdema, when of a chronic character, results in what may practically be called a broad-based polypus,[1] and is the cause of danger to life, not so much from the structural nature of the formation

[1] This view is an application to the larynx of that suggested in my work on *The Throat and its Diseases* (Second Edition, p. 503), that "the situation of true nasal polypi indicates that they originate as a circumscribed œdema of pendulous portions of the mucous membrane."

as from its being situated at the narrowest and least dilatable portion of the larynx, and at one of the points of greatest irritability to cough and respiratory embarrassment. I am unable to agree with the proposition of Catti—albeit it is supported by our President (Sir Morell Mackenzie)—that the cause of the dyspnœa in cases of obstruction from sub-glottic chorditis is due mainly to agglutination of the parts by viscid mucus, for I have seen many in which no such condition existed, but in which paroxysms of suffocation were of alarming character and frequency.

Provided the case be uncomplicated by any specific dyscrasia, early tracheotomy is strongly advocated, and retention of the tube is to be insisted on, either for the rest of life or for some months after the swelling may have happily been reduced by constitutional or local medication or by mechanical means. Such a result is, however, but rarely attained, and the average duration of life after tracheotomy, when peformed for obstruction in this situation, is about eighteen months. There is but faint hope of cure where perichondritis exists, except it be syphilitic, but it is quite possible that surgical treatment of chronic sub-glottic œdema, by cautery or otherwise, directed from below through the tracheal opening, might be attended with success and ultimate dispensation of the tube. Such a method is, at least, worthy of trial.

2. *Tuberculous Laryngitis.*—Early tracheotomy has been advised in this disease on the two-fold plea (1) That the disease may be primary, and that by tracheotomy the lungs will be less liable to be infected; and (2) that functional rest is hereby afforded to the larynx, and a better chance given of success by topical medication. Curiously enough, it has to be added, that one of the strongest advocates of tracheotomy in laryngeal phthisis, Dr. Beverley Robinson, of New York, has also maintained that a laryngitis occurring in the course of a pulmonary phthisis is not necessarily, nor indeed frequently, of itself tuberculous, but is to all intents and purposes of the essence of an ordinary catarrh. Answering the first of these pleas, the probability of the tuberculous disease being primary in the larynx, I have to say that though I for many years believed in the possibility of a primary tuberculosis of the larynx, before it was actually demonstrated as a fact, I cannot agree that such a circumstance is other than rare in medical experience. And as to the second, I am not at all prepared to admit that absolute rest of the larynx is likely to follow a tracheotomy on a tuberculous patient whatever the stage; on the contrary, in no disease is a tube so ill-borne or so liable to set up increased inflammatory irritation and ulceration. Moreover, in no disease is more

likely to occur the untoward risk of what we may call collapse of the larynx—a not unfrequent result of tracheotomy—which was first pointed out by Liston, and has since been insisted on by Whistler. Nor can I agree that the larynx can be more effectively treated by topical measures after tracheotomy than before, for, on account of the disposition to collapse just mentioned, the larynx is almost invariably far more difficult to examine, as also to be treated internally, after a tracheotomy tube has been introduced.

Tracheotomy is advocated by Moritz Schmidt on the ground that it not only betters respiration—to the lungs I presume—but also that it deviates from the larynx the passage of irritating air—to which it has only to be replied that by use of oro-nasal inhalers and suitable atmospheres, the air to the larynx can readily be made non-irritating, and even beneficial, and this to a greater extent than can be provided for in the air which goes to the lungs through a tracheotomy tube.

But the operation is also performed by Schmidt, by Heryng, and by Gouguenheim and Tissier, not only where the laryngeal disease is marked and advancing, but in cases in which the lungs are admittedly affected. The last named joint authors in their recently published classical treatise hold that even extensive disease of the lungs does not contra-indicate the operation, if the temperature be not high, and digestion be good—to which condition I cannot assent, for a comparatively low temperature in laryngeal phthisis is by no means a favourable indication, while a good digestion is a circumstance hardly ever likely to be afforded us as a factor for consideration in this disease, and certainly not in advanced cases.

I must, therefore, with all respect to the many able laryngologists who advocate tracheotomy in tuberculous laryngitis, offer my uncompromising opposition thereto, hardly excepting cases of urgent dyspnœa, in which it is considered as permissible by Solis-Cohen, Morell Mackenzie, and Krishaber. I certainly would not perform it, except at the request of the patient or his friends, and not even then without very plainly stating that, although death by actual suffocation might be thereby averted, life would hardly be prolonged, and that only at some considerable expense of suffering and lingering distress. I think also that we ought to bear in mind that performance of tracheotomy in a case of advanced tuberculous disease is likely to bring both the operation and the surgeon who performs it into disrepute ; for, as to the operation, an unfavourable result in one case may militate against consent being

given to its performance in another, where chances of permanent relief might be good ; and as to the operator, especially if he be a specialist, there will not unlikely be found a medical brother (save the mark !) who will speak of tracheotomy having been performed by one who would not or could not look beyond the narrow area of his special province.

3. The subject of *Lupus* in relation to tracheotomy may be dismissed in a few words, for it is but seldom that there is infra-glottic stenosis. A curious feature of this disease, when occurring in the larynx, which amongst others, distinguishes it from tuberculosis, is that there is considerable anæsthesia, and by far the majority of patients that come under notice have experienced no symptoms of dysphagia or dyspnœa, which warned them of the extent of the tissue change which is found on examination to exist. A striking example of this circumstance occurred in the practice of my colleague, Dr. Orwin. The case which had been published by him, and is also, by his permission, narrated and depicted in my work, was that of a girl, aged twenty-one, who applied for treatment on account of lupus of the nose, but who, on examination, was found to have such agglutination of the ventricular bands that the orifice between them was reduced to the size of a goose quill ; a normal voice and complete absence of stridor showed that this stenosis was supra-glottic. Dr. Orwin, recognising the danger of leaving such a condition unrelieved, commenced dilating treatment; this producing gradually increasing stridor, tracheotomy was performed, but, as a matter of fact, the patient stated that she had never suffered seriously with her throat, and "reckoned it well" on her application at the hospital, though, in all probability, as elicited in the history, this supra-glottic stenosis had existed upwards of ten years. No stronger illustration could be offered as to the necessity of examining the larynx in every case of lupus.

4. There are two stages of *Syphilitic Laryngitis*—I might add *Tracheitis*—in which the question of tracheotomy has to be considered. The first, that of acute œdema, which is so common an occurrence in the earlier tertiary period. This œdema may occur during the ulcerative process, or it may be due to development of a gumma, or to perichondritis, and will often be reduced by prompt and appropriate constitutional measures, and in no disease will the surgeon who uses the laryngoscope both intelligently and diligently have more gratifying reward for patient watching and perseverance in treatment. Of such a fact the experience of all specialists will afford example. I will mention one of several, in which a patient—I need hardly say a hospital one, for private patients are seldom so constant

—has attended me weekly or fortnightly for about fifteen years. Twice he has been taken to a general hospital and threatened tracheotomy, but he has been now free from acute attacks for nearly ten years. He is the subject of more or less glottic stenosis, for which he is treated by the passage of a large cotton wool brush, charged with a solution of sulphate of copper.

Supposing a tracheotomy to be called for in such a case of œdema there is a reasonable hope that the tube may shortly be dispensed with. A pea-valve may always be very early employed, and the sooner an orifice is made in the upper aspect of the tube the better. Some years ago I saw in consultation and assisted in the operation and treatment of a colonel in the army, under the care of Mr. Nunn, in which case, after three months and for a period of nine, the patient gave the word of command with the tube in his throat, and was enabled to dispense with it permanently at the end of a year.

The second phenomenon in the course of a syphilitic laryngitis, for which tracheotomy is indicated, is that of stenosis, and this is usually infra-glottic in position. It occurs at a quite late period, ten, fifteen, twenty, or even thirty years after primary infection, and is due either to deforming cicatrices or to the deposit of fibroid tissue at situations not necessarily the seat of previous ulceration.[1] Without doubt these cases are becoming less frequent, and will become still more rare, as the use of the laryngoscope and *topical*[2] laryngeal medication becomes more general. They are at the present day much more uncommon in the United Kingdom than in Austria-Hungary and Poland: whether this circumstance is due to causes racial, climatic, hygienic, or dietetic—I speak more especially of the use of raw spirits—is not now a question to be considered, but it is important to note that the treatment adopted also differs essentially, or at least yields very different results. I suppose few of us can claim many such cures of sub-glottic and tracheal stenosis as are reported by Schroetter of Vienna, Navratil of Buda-Pesth, or Heryng of Warsaw. I confess that I have seldom had a case in which attempts at mechanical dilatation *without cutting* have not rather

[1] See Article on "*Syphilis of the Larynx, Trachea, and Bronchi*, by John Nolan Mackenzie, M.D., of Baltimore, in Wood's *Reference Handbook of the Medical Sciences*. Vol. IV., p. 422. New York, 1887.

[2] The word "topical" is emphasized here, because while I am ready to admit that many cases of syphilitic inflammation and ulceration in the larynx can be healed by appropriate general treatment alone, it is only by carefully directed topical applications that deforming cicatrisation so generally the result of the healing process can in any degree be controlled.

increased the distress and precipitated a tracheotomy by promoting suffocative spasms of a serious grade, nor have I after opening the windpipe been much encouraged to persevere in mechanical dilatation with any hope of being able to remove the tracheotomy tube. I believe it to be better—certainly more humane—surgery whenever we are convinced that there is an obstinate stenosis due to syphilis, to perform an early tracheotomy, and to advise a life-long retention of the tube. I have only to add that the lower the tracheotomy can be made in such a case the better, for nothing is more deceptive than the apparent high situation of a stenosis as viewed by the mirror, and nothing more distressing than the disappointment so frequently experienced of finding that our tube has not reached the stricture, or if it has relieved an upper one, its introduction has been rendered useless by the existence of another at a lower level.

5. In *benign neoplasms* tracheotomy is sometimes necessary where the growths being situated on the under surface of or beneath the vocal cords, attempts at removal set up suffocative spasm. In such a case it is better to perform tracheotomy early and at leisure, after a mild warning, than to have to do so as a matter of urgency. After the operation the growths can not unfrequently be removed from below the glottis through the external tracheal orifice. The operation is also sometimes necessary in the case of multiple congenital papillomata, as a preliminary to thyrotomy or other procedure. Dr. Hunter Mackenzie has quite recently (*Lancet*, April 6, 1889) recorded a case in which tracheotomy having been performed on a child, aged five years, on account of laryngeal growths, the tube could be permanently removed at the end of a year because the growths had *spontaneously* disappeared. He states that "it is now about "six years since the operation was performed, and during the whole of "that time there has been no indication of any tendency to recurrence of "the growths. The voice is clear, the cords are healthy in colour and "outline, the breathing is normal, and the development of the boy is good.' This case affords a striking example of the advantages of functional rest and its attainment by tracheotomy.

6. *Malignant neoplasms* of the larynx call, in my judgment, for early tracheotomy, that is to say, so soon as there is any impediment to respiration, whether it is intended to remove the growth or not. In spite of one, or at the most of two or three, rare cases in which resection of the larynx has been successful, by affording a period of prolonged life, with comfort equal to that by tracheotomy, I have, as the result of a by no

means small experience, come to the conclusion that attempts at radical removals of a cancer of the larynx are not only highly dangerous immediately, but most unsatisfactory in the more remote relations, of recurrence of disease and prolongation of comfortable life, and that they do not bear favourable comparison in any one respect with the operation of tracheotomy. It is most important to note that this last operation exerts a favourable influence in several directions : (1) in relief of dyspnœa ; (2) in retardation of the disease, especially in the case of an intrinsic epithelioma ; (3) in relation to dysphagia, which is almost always relieved to an extent that at first thought might appear inconsequential ; and, lastly, as a result of this relief of dysphagia, by an absolute improvement in body weight and general well-being. I could relate many cases in support of each of these arguments in favour of the strong position I venture to take for early tracheotomy in malignant disease of the larynx ; and I need not refer to the oft-quoted statistics of Fauvel in support of my contention. One patient was presented at the meeting after the reading of this paper, on whom my colleague, Dr. Dundas Grant, had performed tracheotomy some thirty-two months previously, with all the good results which I have enumerated.

An important element in considering the question of any operation on the larynx for malignant disease is the determination as far as possible, whether we have to deal with an epithelioma—*cancer* in fact—or with a sarcoma. Cancerous growth, if it can be called growth—perhaps it would be better to say the cancerous process—has, within each of its constituent elements *intrinsic* decay, which commences almost from the date of its birth. A sarcoma, on the other hand, represents an unlimited repetition of cell growth, which decays by the ordinary process of inflammation ; in other words, either from *extrinsic* irritation, or from the new growth increasing beyond the power of the vascular and nervous supply to sustain living. Sarcoma, therefore, while it ranks as a less malignant disease than epithelioma, is the more terrible when it occurs in the air passages, as it knows no bounds, and much more frequently and more immediately invades the lymphatics.

In a case, therefore, of supposed malignant disease of the larynx, and especially if the respiratory mechanism be impaired, no good purpose is subserved by delay, for supposing even that the diagnosis should haply have been made of a graver malady than the after history confirms, and the cannula may in time be even dispensed with, not only would no harm have been done, but, on the contrary, there would have been a gain to

the patient, if only in the saving of the muscular force wasted absolutely in dyspnœic breathing. This is a consideration but too often neglected, except in the case of paralyses, in which it forms, according to all writers, the chief, and sometimes an exceptional, argument in favour of an early tracheotomy.

And this brings us to the last disease which I have noted—namely, (7) *Neuroses of the Larynx*—for consideration in relation to our subject for discussion. The only form of laryngeal paralysis for which tracheotomy is indicated is that in which the abductors are both implicated; and I do not think we need make any great distinction, in case the dyspnœa be urgent, between neuropathic and myopathic cases. I would only make a respectful claim for rather more patience than is often allowed in efforts at treatment, constitutional and local—of the latter, I would especially name strychnia injections and the use of the constant current—and I would also say a few words as to those cases in which bilateral paralysis of abduction occurs from pressure of an enlarged thyroid, enlarged bronchial glands, malignant disease of œsophagus, or an aneurism. In neither instance is it easy to ascertain how much of the distress may be due to direct compression of the windpipe, in which case the dyspnœa is paroxysmal, and how much to implication of both recurrents, when the difficulty of breathing is as a rule continuous, for in point of fact both conditions may exist simultaneously. Only in the case of goitre is there much chance of relief by operation, and that not as a rule of the nature of an artificial opening, but by removal of a portion of the gland, or by electrolysis. Whenever bilateral paralysis of the abductors is caused by enlarged bronchial glands, by cancer, or by an aneurism about the bifurcation, we may be pretty certain that there is also direct pressure, with probably a thinning of the tracheal wall at the seat of stricture; and that therefore tracheotomy will be futile.

To resume shortly:—

1. Early tracheotomy, with retention of the tube, is advocated in *chronic sub-glottic laryngitis* and in *perichondritis*, causing sub-glottic stenosis. In these conditions a *high* tracheotomy is permissible and even preferable if further treatment be contemplated.
2. Tracheotomy, either early or late, is not advocated in *tuberculous laryngitis.*
3. It is but rarely necessary in *lupus.* When required, the *high* operation meets every indication.

4. It is to be performed in *œdema*, occurring during the course of a *syphilitic laryngitis*, only after constitutional and local treatment have failed ; and when performed for such a condition there is a fair chance that the tube may after a time be dispensed with. The *high* operation is usually sufficient.

   Tracheotomy is preferable to attemps at dilatation in the case of *syphilitic stenoses*, and the tube has generally to be retained for life. Not unfrequently the operation fails on account of inability to reach the seat of stricture, and the trachea should therefore be opened at the *lowest* possible point.

5. The operation may be necessary in *benign growths* of the larynx, and, when indicated, is better performed early and at the *high* situation.

6. Early tracheotomy is strongly advocated in *malignant disease* of the larynx as the safest and surest means of prolonging comfortable life, and in this respect is superior to attempts at radical extirpation. From the tendency of malignant disease to spread downwards the windpipe should be opened at the *lowest* position attainable.

7. Tracheotomy is necessary in cases of *bilateral paralysis of abduction*, and should not be delayed if treatment fails to arrest the progress of the disease. For these cases the *high* operation is indicated.

   It is seldom successful in cases of dyspnœa, caused by pressure low down in the trachea, and when attempted the *low* situation must of course be selected.